

WHAT IS CLAIMED IS:

1. A compound of the formula:

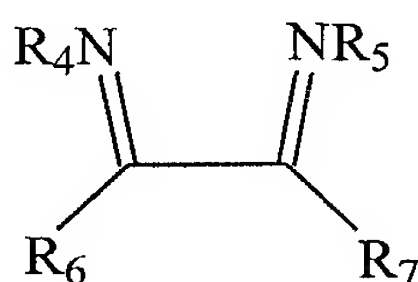


wherein:

M is a suitable photoexcitable metal,

R₁ and R₂ are ligands which are each independently ethylenediamine or a substituted derivative thereof, or substituted or unsubstituted aryl or heteroaryl of 1 to 5 rings, and

R₃ is a ligand having the following structure:



wherein:

R₄ and R₅ are -H or lower alkyl,

R₆ and R₇ are taken together to form a

substituted or unsubstituted, fused aromatic or

heteroaromatic ring system comprising at least four rings, wherein

each ring contains from 0 to about 3 heteroatoms; and wherein

substituents on said substituted rings are -H, -R, halo, -OH, -OR,

-NH₂, -NHR, -NR₂, -CN, -NO₂, -SH, -SO₃, -OSO₃, -C(O)OH,

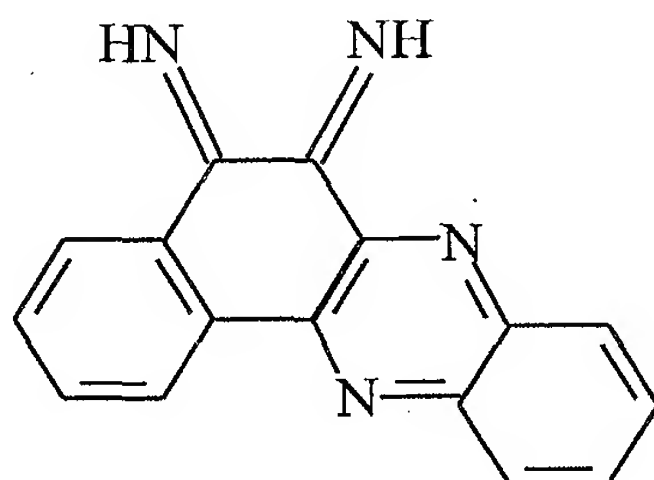
-C(O)OR, -C(O)NH₂, -C(O)NHR, -C(O)NR₂, -SO₃R, or -OSO₃R,

wherein each R is independently lower alkyl, cycloalkyl, lower alkenyl, lower alkynyl, or phenyl.

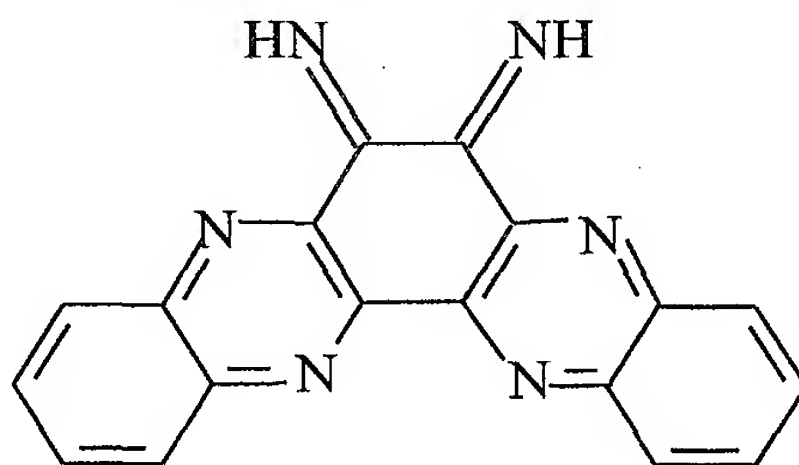
2. The compound according to claim 1, wherein M is Rh, Ru, Co, Fe, Cr, Cu, Zn, Cd, or Pb.
3. The compound according to claim 1, wherein R₁ and R₂ are bidentate ligands.
4. The compound according to claim 3, wherein R₁ and R₂ are each independently

2,2'-bipyridine, 4,4'-dimethyl-2,2'-bipyridine, or 4,4'-diamido-2,2'-bipyridine.

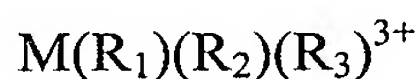
5. The compound according to claim 1, wherein R_3 comprises at least 4 aromatic or heteroaromatic rings, wherein each ring contains from 0 to about 2 heteroatoms.
6. The compound according to claim 5, wherein said heteroatoms are nitrogen, oxygen, or sulfur
7. The compound according to claim 6, wherein each of said heteroatoms is nitrogen.
8. The compound according to claim 7, wherein R_3 is:



9. The compound according to claim 7, wherein R_3 is:



10. A method for detecting a base-pair mismatch in a nucleic acid duplex, said method comprising forming a complex comprising said nucleic acid duplex and a compound having the following formula:

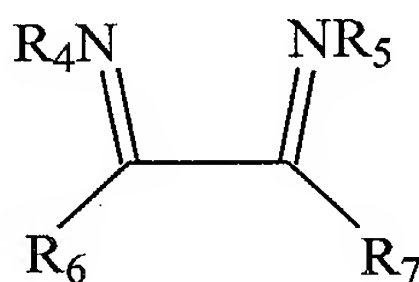


wherein:

M is a suitable photoexcitable metal,

R₁ and R₂ are ligands which are each independently ethylenediamine or a substituted derivative thereof, or substituted or unsubstituted aryl or heteroaryl of 1 to 5 rings, and

R₃ is a ligand having the following structure:



wherein:

R₄ and R₅ are -H or lower alkyl,

R₆ and R₇ are taken together to form a substituted or unsubstituted, fused aromatic or heteroaromatic ring system comprising at least four rings, wherein each ring contains from 0 to about 3 heteroatoms; and wherein substituents on said substituted rings are -H, -R, halo, -OH, -OR, -NH₂, -NHR, -NR₂, -CN, -NO₂, -SH, -SO₃, -OSO₃, -C(O)OH, -C(O)OR, -C(O)NH₂, -C(O)NHR, -C(O)NR₂, -SO₃R, or -OSO₃R, wherein each R is independently lower alkyl, cycloalkyl, lower alkenyl, lower alkynyl, or phenyl, and
subjecting said complex to conditions allowing detection of a signal, wherein the presence of a signal is indicative of the presence of a base-pair mismatch.

11. The method of claim 10, further comprising exposing the nucleic acid duplex and the compound to cleavage conditions, and determining the presence or absence of cleavage products, whereby the presence of cleavage products is indicative of a base-pair mismatch.

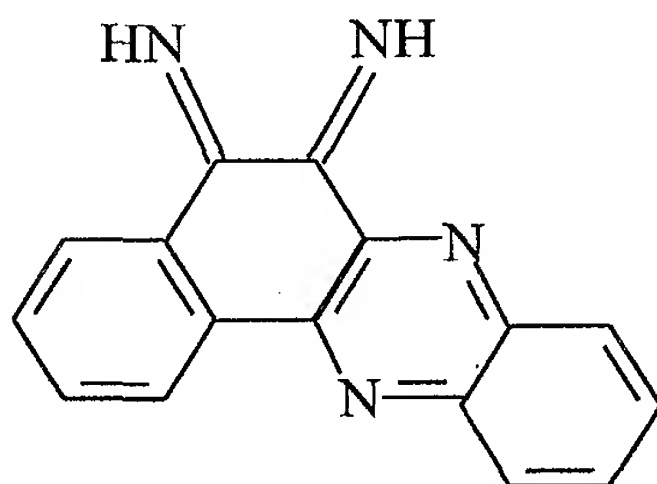
12. The method according to claim 10, wherein M is Rh, Ru, Co, Fe, Cr, Cu, Zn, Cd, or Pb.

13. The method according to claim 10, wherein said compound has the structure wherein:

M is Rh or Ru,

R₁ and R₂ are each 2,2'-bipyridine, and

R₃ is

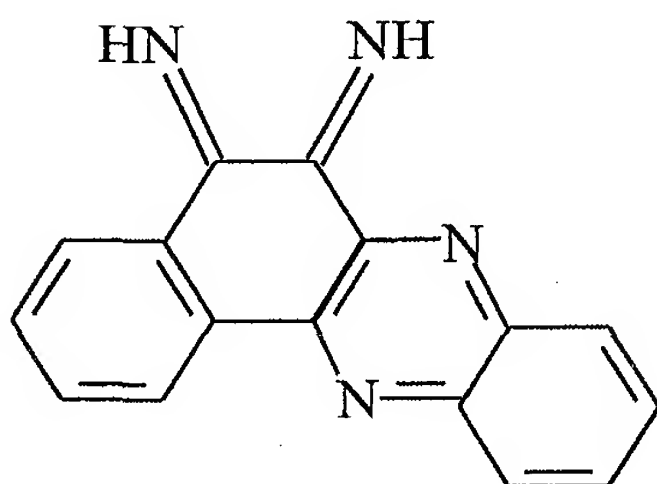


14. The method according to claim 13, wherein said compound has the structure wherein:

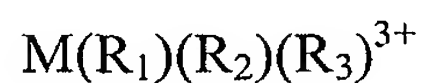
M is Rh,

R₁ and R₂ are each 2,2'-bipyridine, and

R₃ is



15. A method for detecting a base-pair mismatch in a nucleic acid duplex, said method comprising forming a complex comprising said nucleic acid duplex and a compound having the following formula:

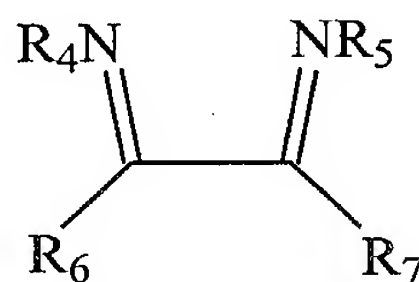


wherein:

M is a suitable photoexcitable metal,

R_1 and R_2 are ligands which are each independently ethylenediamine or a substituted derivative thereof, or substituted or unsubstituted aryl or heteroaryl of 1 to 5 rings, and

R_3 is a ligand having the following structure:



wherein:

R_4 and R_5 are -H or lower alkyl,

R_6 and R_7 are taken together to form a substituted or unsubstituted, fused aromatic or heteroaromatic ring system comprising at least four rings, wherein each ring contains from 0 to about 3 heteroatoms; and wherein substituents on said substituted rings are -H, -R, halo, -OH, -OR, -NH₂, -NHR, -NR₂, -CN, -NO₂, -SH, -SO₃, -OSO₃, -C(O)OH, -C(O)OR, -C(O)NH₂, -C(O)NHR, -C(O)NR₂, -SO₃R, or -OSO₃R, wherein each R is independently lower alkyl, cycloalkyl, lower alkenyl, lower alkynyl, or phenyl, and
subjecting said complex to cleavage conditions, and determining the presence or absence of cleavage products, whereby the presence of cleavage products is indicative of a base-pair mismatch.

16. A method for diagnosing a genetic disorder, said method comprising contacting a compound according to claim 1 with a mammalian cell having or suspected of having such a disorder, and optionally treating said cell with sufficient light to cause a detectable signal and/or polynucleotide cleavage, whereby detection of a signal or polynucleotide cleavage fragments is indicative of a genetic disorder.

17. A method for treating a subject having a genetic disorder characterized by base-pair mismatches in a nucleic acid duplex, said method comprising administering to a subject in need thereof an effective amount of a compound according to claim 1.

18. The method of claim 17, wherein the compound includes a cytotoxic molecule attached thereto.

19. A method for detecting base-pair mismatches in nucleic acid duplexes, said method comprising forming a complex comprising said nucleic acid duplex with a compound according to claim 1, subjecting said complex to photocleavage conditions, and determining the presence or absence of cleavage products, whereby the presence of said cleavage products is indicative of a base-pair mismatch.

20. The method of any of claims 10, 15, 16 or 19, wherein the base-pair mismatch is a single nucleotide polymorphism (SNP).

21. The method of any of claims 10, 15, 16 or 19, wherein the base-pair mismatch is a guanine-adenine pairing.

22. The method of any of claims 10, 15, 16 or 19, wherein the base-pair mismatch is a adenine-adenine pairing.

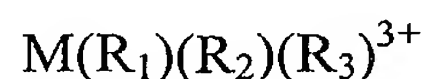
23. The method of any of claims 10, 15, 16 or 19, wherein the base-pair mismatch is a guanine-guanine pairing, a thymine-thymine pairing, a cytosine-cytosine pairing, a guanine-thymine pairing, a cytosine-thymine pairing, or a cytosine-adenine pairing.

24. A kit for detecting base-pair mismatches in nucleic acid duplexes, the kit comprising:
carrier means containing therein one or more containers wherein a first container contains a compound according to claim 1.

25. The kit of claim 24, wherein one other container contains oligonucleotides or a substrate containing oligonucleotides specific for a gene, gene locus, or polynucleotide sequence of interest.

26. A composition comprising two complementary oligonucleotide strands having a base-pair mismatch, and a compound of the formula $M(R_1)(R_2)(R_3)^{3+}$.

27. A plurality of sterically demanding intercalating compounds of the formula:

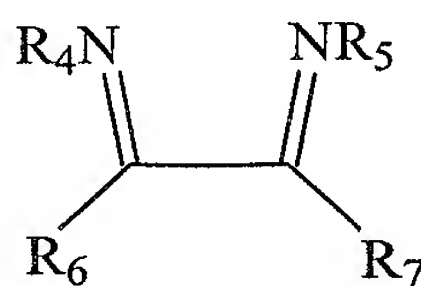


wherein:

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